

# **IR-Band Ambient Light Phase Drift Analysis via Stereoscopic IR Camera Configuration for Aircraft Wake Detection**

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2026 June 8

The detection of low-observable aircraft, particularly whereas the exhaust of those aircraft tends to be directed in the opposite direction of airborne IR sensors, makes it difficult to fully leverage IR sensing on fighter platforms.

The advent of precision timing mechanisms of sufficient miniaturization to be carried aboard fighter jets and even in hand-held devices makes it possible to implement novel techniques which support remote metrology.

Stereoscopic Phase Drift Analysis, which can also, incidentally, be used to estimate the range of RF radio sources without the need for triangulation, could also be implemented in the infrared band in order to detect not infrared sources directly, but to detect distortion to ambient IR originating from behind the wakes created by aircraft.

Anyone who has ever seen a jet contrail knows that bodies of turbulent air are created which can stretch for miles behind an aircraft. The visible portion of a jet contrail is merely that portion which contains atomized water droplets. There is, however, a much larger area of disturbed air which can be as much as a mile wide and seven miles long. These disturbances are invisible to the naked eye and are, nevertheless, present. Although the amount of IR generated by the silhouetting atmosphere behind an object is modest, it is sufficient; in the aggregate, particularly given the scale of the atmospheric disturbances created by aircraft, to be detected by a sensor.

Rather than looking for IR sources directly associated with an aircraft's integument or engines, this author proposes that it would be useful to focus upon ambient IR light emanating from the area behind a region of sky one wishes to scan for aircraft.

If ambient infrared light passes through an area of disturbed air consistent with the recent presence of an aircraft of the scale of a fighter jet, that disturbance could be detected through passive means by comparing the precise arrival time of waves of IR light at each of two IR sensors separated by some distance. By closely analyzing the phase drift of waves of light (possible only with precision timing) as seen from one perspective versus another, the degree of turbulence in that section of atmosphere could be estimated. Large formations of attack aircraft would have an even more pronounced effect upon the atmosphere which could not be concealed from sensors configured in this manner.